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LI. *An Account of the Effects of Lightning on three Ships in the East-Indies: By Mr. Robert Veicht. Communicated by William Lewis, M. D. and F. R. S.*

Read Nov. 22,
1764.

AUGUST the 1st 1750. Lat. $1^{\circ} 56' N$. Malacca bearing about N. E. All this day there was a fresh breeze, S. to S. S. E. the weather being hot and sultry. The evening was fair and clear; and when day-light was gone, there was not a cloud in the sky; and the water was so clear of vapour or mist, that the stars could be seen to rise out of the horizon.

This serenity continued till about 2 A. M. when a black cloud appeared above the horizon in the W. and W. N. W. and continued to rise very fast; and the flashes of lightening, which proceeded from it, succeeded each other very fast. In $\frac{1}{4}$ of an hour, it covered almost half the hemisphere, and as it approached, the wind from the S. E. began to fail, and died quite away at last.

By the time the clouds had covered half the hemisphere, the wind proceeded from it in great violence, and the flashes of lightening were very frequent, and we judged of their nearness to the ship by the interval betwixt the flash and report, according as this interval was longer or shorter. The whole heavens were now covered with this cloud, and the flashes of lightening happened at times on different sides of the ship, which had all the sails
I furl'd

furled before it came upon her. It must be remarked, that the wind, which reached the ship before the thunder, brought with it a violent and heavy rain, which sufficiently soaked the ship and every thing about her. The ship was all this time, which was in about half an hour after its first appearance above the western horizon, in the midst of repeated flashes of lightening, which were just upon the ship by her trembling and shaking on every explosion, and the flash and clap coming in the same instant, and the officers and people were apprehensive of damage to the mast.

2 $\frac{1}{2}$ A. M. At this time a clap burst, as was judged by the report, about mid-way betwixt the head of the mast and the body of the ship, or it might be higher, and in descending might cause that appearance, and just over it. This made the ship tremble and shake as if she was going to burst into pieces, and great pieces and splinters of the mast were fallen upon different places of the ship; but it was so very dark, we could not see from which of the masts they were forced.

Immediately after this first came a second, which burst just above, and on the quarter deck of the ship, which by the report was as great, and being close upon the deck was more terrifying than the former.

Here I must take notice, that the wind brought very heavy rain before the thunder came near the ship; and in proportion as the thunder approached the ship, the wind, which came in violent gusts at first, decreased gradually, and the rain was less heavy; and when the thunder surrounded the ship, and broke upon her, it was almost calm. And we
could

could not only judge of the nearness of the thunder by the tremor and shaking of the ship, and the report instantaneously following the flash ; but we could also hear several of the flashes fall into the water close upon the ship.

We reckoned, that the first clap, which burst at the main-mast, was what damaged the mast ; the second having burst betwixt the main-mast and mizen-mast.

At this time we came to an anchor, and continued till day-light, that we might examine into the damage we had received ; for, as pieces of the mast were carried to all places of the ship, we imagined, that all the masts had been hurt.

At day-light we found, that the fore-mast and mizen-mast had escaped, and the main-mast had suffered as follows :

All the main-top-gallant-mast (which is the uppermost piece of the mast) from the rigging at the top of it, to the cap at the head of the main-top-mast, was entirely carried away, part falling over-board, and part into the ship in different places. The main-top-mast had great pieces carried from it, from the hunes down to the cap, at the head of the main-mast, so that it could but just stand, being hardly strong enough to bear its own weight, and that of its rigging. The main-mast being composed of three pieces, towards the top of it, those of the sides, being of oak, called the cheeks, were not hurt ; but the middlemost part, being of fir, was shivered in several places, and pieces were carried out of it 6 or 7 inches in diameter, and from 10 to 12 feet long, and this in a circular descending manner from the parrel of
the

the main-yard down to the upper deck of the ship, the pieces being taken out crooked, or circular, or strait, according as the grain of the wood ran. It must be remarked, that these claps were not one single explosion, but successive explosions, about the dimensions, as near as we could guess, of small shells, and continued some time cracking after each other ; and as the lightening is observed to run not in strait line, but zig zag, so these different explosions might be differently placed in the air ; that when they came to take fire and burst, they might take the pieces out of the different sides of the mast as above related.

In great ships the masts are composed of three parts, erected upon one another, the lowermost part is called by its proper name, the middlemost part is called the top-mast, and the uppermost part the top-gallant-mast. The mast, which was here damaged, was the main-mast, or principal mast of the ship, and which stands near the middle ; and sometimes the name of main-mast is applied to all the three pieces as they stand erected, and sometimes to the lower piece, or part of the mast only : and when they are distinguished severally, they are called the main-mast, main-top-mast, and main-top-gallant-mast.

Each of these parts of the mast are divided as to length, and have their proper names accordingly ; and generally into three parts in common conversation, *viz.* the head part, which reaches from the upper extremity to the place, where the rigging is fixt ; the middle part, which reaches from a little below the rigging, to that place, where the lowermost part be-

gins, and this is often called the hoist, or hoisting part; and the lowermost part, called the heel, reaches to the lower extremity. There is the same division of all the three parts; of which the mast is composed; but of the lowermost part of the mast, the heel part of it is hid below the upper deck in the body of the ship.

At the top of the main-mast, on the extremity, is fixed a piece of wood, which has a hole in it; and at the lower part of the head of the main-mast are also fixed some pieces of wood cross each other, on which lies a scaffolding called the top: through these the top-mast is thrust upwards; and when erected at its greatest height, the lower part of the top-mast, called the heel, and the upper part of the main-mast lie close to and against each other, and betwixt the top, or scaffold, and the cap: and so the top-mast and top-gallant-mast together: but the head part of the top-gallant-mast, as there is no other above it, is tapered away to a point, whereon is fixed an iron spindle and vane.

As a ship does not at all times carry her sail of the same height, but higher or lower in proportion to the strength of the wind or other circumstances, it is upon the middlemost of the three parts above-mentioned, into which the masts are divided as to length, that the sails are made to slip up and down, and are attached to the mast by several pieces of wood fixed by a rope round it to the yard, that extends the sail, and this slips up and down along with the yard, and is called the parrel.

And as it is necessary to cover these masts with some matter, that may preserve them from the weather

weather and sun, they are therefore covered with different kinds of matter, according to the uses of the different parts of the mast.

The head and heel parts of the masts are always covered with tar mixed into a consistence with lamp black, and this being frequently repeated, it forms at last a covering of the thickness of a crown, and sometimes a quarter of an inch; through which as the Sun cannot pierce, it is commonly without flaw or rent; but the middlemost part, upon which the sail slips up and down, is always rubbed with tallow, or grease, or hogs lard, to make it more slippery; and this being frequently scraped off, and anointed afresh, and in hot weather, or the summer time, it becomes extremely thin, being melted off, and frequently and in many places rubbed off by the slipping up and down of the sail and parrel, which exposes it so much, that the Sun sometimes rends it from end to end almost, and so deep as to reach the centre of the mast, and an inch wide. But as the yard, which extends the lowermost sail upon any of the masts, is commonly carried at the same height, the middlemost part of this mast is usually covered with rosin mixed with tallow or oil, and sometimes turpentine mixed with the same; and this being soft, cracks and melts with the Sun, and so leaves some places of the mast bare, and this will rend and split also like the top-mast and top-gallant-mast, that are covered with tallow or grease, but not quite so large rents.

We are now to observe, that no part of the top-gallant mast or top-mast, that was covered with the lamp black were touched with the thunder, the

greasy part only being carried away. The head of the top-gallant-mast, from the rigging upwards to the spindle, was entire, as was also its heel, for the lightening did not touch the heel, but missed the whole both of top-gallant-mast and top-mast, that lay betwixt the cap and upper end of the greasy part of the mast. Of the top-mast great pieces were carried out, of many feet in length, and 9 or 10 inches in thickness, and this on different sides of the mast, for the whole length of the greasy part. From the top of the main-mast to the upper end of that, which is covered with turpentine, there was no damage; but, from thence downwards, the cheeks were started off from the middle part, and pieces taken out winding asslant down the mast, and out of the fir part many feet in length, and 6 and 7 inches deep, and near the upper deck a piece as large as the body of a man, and 11 or 12 feet in length.

I imagine, that the vapour having insinuated itself into the rents and cracks of the mast, takes fire, and expanding itself every way, is the occasion of pieces of the mast being carried to the most distant parts of the ship; and, as a proof of this, the oak cheeks above-mentioned, though extremely well fixed to the middle part of the mast, which was of fir, by spikes and bolts, which were clinched, they having shrunk, and thereby having left the jointure a little open, had made way for the vapour to insinuate itself, which might be the occasion, that the cheeks were started off at the lower part, and the rope, wherewith they were woolded together to the middle part in four different places, with 12 turns of $2\frac{3}{4}$ inch rope in circumference, were burst all to pieces.

It must likewise be remarked, that the yards, which lay in a horizontal position, were not touched or hurt. Indeed they are always covered with lamp black and tar, as the heels and heads of the mast are, and this frequently repeated ; yet they had many and large rents in them ; but whether the matter, which covered them, or their horizontal position, was the reason of their escaping the thunder, is left to the learned to determine. For in this situation you have nothing to do but to sit with your arms across, and compose yourself in expectation of your fate.

I must also take notice, that no part of the rigging was hurt ; for although the middle part of the top-gallant-mast, which was 18 feet long, and 9 inches diameter, was entirely burst to pieces, and carried away ; yet the rigging, which surrounded the upper part, was neither burnt, scorched, nor broke. Neither did it touch the caps on the mast heads, nor the top, or round scaffolding on the mast, and in this ship it was 18 feet broad ; and these as well as the yards were covered with tar and lamp black, and made of three inch deal.

I must likewise take notice, that upon the upper deck of the ship are two convenient boxes built, divided into two and into three parts, wherein are placed a lamp, which burns in the night, and a compass, whereby the ship is steered. One of these was placed very near to the main-mast in the middle of the ship, and the other close to the mizzen-mast, and both the lamps were burning at the time of the first explosion ; and immediately, upon orders given, all the lights in the ship were extinguished before the bursting of the second clap ; the officers imagining the in-

flammable vapour might be attracted by the flame of the lamp and fired thereby.

At the time of the first, I believe, there might be more than sixty men upon deck, and some of them very near the mast at the very time of the clap. Some of these were stunned and beat down; and in their arms, where they thought themselves hurt, they had a numbness, which continued some time, but not any of them otherwise hurt. Luckily before the second, the men, who were upon the quarter deck, in number about twenty, had time to retire under the auning, which is a projection of the deck of the cabin to shelter from the sun or rain; so all escaped unhurt, though sufficiently frightened. And indeed the second flash was most terrible, as it was an explosion of a great number of balls, which went off after each other, cracking like shells, which continued for the space of half a minute; and from which there was no retiring, as the door of the cabin was shut; and I believe they might have set the ship on fire, but for the great rain, which had fallen immediately before this. After this time we were in no more danger this night, the thunder being all past the ship, less frequent, and not so loud, and removing by degrees to a greater distance: and by day-light, which is here a little after five, the sky was quite cleared; a fine day; and the wind returned to the S. E. quarter.

In these cases of thunder there is not any precaution taken farther, than stopping the upper part of the pumps, because they pierce all the decks even to the outside plank in the bottom of the ship. If at sea, the sails are for the most part taken in; and

in port the men are ordered under cover, and the hatches are laid over and covered. The scuttle to the powder-room is well covered with wet swabs, and the passage secured.

Before I end this account, I shall give you the relation of an accident from thunder at Batavia.

Anno 1746. A Dutch ship, lying in the road of Batavia, having taken leave of the governor, was ready to depart for Bengal. The afternoon was calm, and towards evening they had loosed their sails, and lay ready to take up their anchor upon the coming off of the wind from the land, which is common every night. A black cloud was gathering over the hills, and the wind brought it towards the ship: by the time the cloud and the wind reached the ship, a clap of thunder burst from it just over the ship, and set fire to the main-top-sail, which being very dry, burnt with great fury; and this set fire to the rigging and mast. They immediately attempted to cut away the mast, but were hindered by the falling of the rigging, which was burnt, from the head of the mast. By degrees the fire communicated to the other masts, and obliged the people to desert the ship; and afterwards it took hold of the body of the ship, and burning down to the powder, the upper part of the hull blew up, and the bottom part sunk in the place, where she was at anchor.

Anno 1741. Bencoolen road on the S. W. side of the Island of Sumatra, Lat. 4° 0' South. There lay here two ship, one an European, the other a country trading ship, both belonging to the East
India

India Company. Here, as well as in the streight of Malacca, you have periodical winds, which blow for six months of the year from the same quarter of the horizon, and the other six months from the opposite quarter; and it is observable, that these thunder-showers and squalls of wind usually come contrary to these stated winds, which are calmed during the thunder, but return to their constant quarter as soon as the thunder and rain are past. If I recollect aright, in the above year 1741, in June, the weather was very hot and sultry, and the constant wind but very faint. The wind came after this from the land, and almost opposite to the usual point a very faint air; and the thunder was frequent and close to the ships, which lay near each other, but the fog and rain prevented their seeing each other; but they often trembled and shook by the explosion of the thunder. One of these claps burst upon the country ship, which by this time had her top-masts struck; that is, lowered down along the lower-masts. This clap carried away and burst to pieces all the part of the lower-mast from where the yard is carried aloft to within six or seven feet of the upper deck. The mast was woolded with ropes of $2 \frac{1}{2}$ size in different places, which were burst asunder at every turn of it; and the mast all shivered into small splinters, and mostly carried overboard. Here also the main-mast was made of fir, and the part, which was split and shivered to pieces, was the part usually coated with turpentine mixed as before-said with tallow or oil: and the main-top-mast, which was made of a wood of the country called teak, and is of a texture like to oak, but stronger, was untouched, notwithstanding

it lay parallel, and touched the mast for the whole length of the part carried away. Here the vapour must be very low, being wholly below the top, which was unhurt, as was all the rigging and yards of this particular mast. And from the upper deck of the ship to the top could not, in this ship, which was but small, exceed 42 or 44 feet. And in this last case the explosion must have been like gunpowder endeavouring to expand itself every way, because the top and top-mast, and rigging, which was above it, sunk perpendicularly down on the body of the ship, as did the top-mast also, which pierced the upper deck, and stood upright. In this ship there might be at the time of the explosion seventy men upon deck, and not one of them hurt; which I imagine was owing to the vapour being distant above the deck more than the height of a man, as was apparent from a remnant of the mast, which was not touched for six or seven feet immediately above the deck.

The relater was an eye-witness to both these accidents. In this last there remained a stinking vapour for some time; but in the first case there was not the least smell of sulphur, or any other thing.

Robert Veitch.